XX. *Elements of new Tables of the Motions of* Jupiter's *Satellites: In a Letter to the Reverend* Charles Maſon, *D. D.* Woodwardian *Profeſſor in the Univerſity of* Cambridge, *and F. R. S. from Mr.* Richard Dunthorne.

SIR, Cambridge, March 3, 1761.

Read March 5, 1761. THE public employment *, wherein I am at preſent, and for ſeveral years paſt have been, engaged, not permitting me to make new tables of the motions of Jupiter's ſatellites, according to the laſt corrections I had (from a compariſon of more than eight hundred obſervations) made in the places and orbits of thoſe planets, I am at laſt perſuaded to communicate, by your means, to the Royal Society, the elements of thoſe tables, hoping they will prove no unacceptable preſent to aſtronomers.

The tables are deſigned upon the plan of thoſe of Mr. Pound for the firſt ſatellite, publiſhed in the Philoſophical Tranſactions, N° 361. except that I have not deducted the greateſt equations from the epochs, as is done by Mr. Pound.

The epochs of the conjunctions of the ſeveral ſatellites with Jupiter, fitted to the Julian year (before the alteration of the ſtyle in England), and to the meridian of the Royal Obſervatory at Greenwich, are as follows.

* That of ſurveyor to the corporation of the great level of the fens.

Jul. years current.	Conj. 1ſt ſat. D.H. ′ ″	Num. A.	Num. B.	Num. C.	Conj. 2d ſat. D.H. ′ ″	Conj. 3d ſat. D.H. ′ ″	Conj. 4th ſat. D.H. ′ ″
1728	0 21 58 16	630	651	484	0 21 20 06	4 57 09	3 25 0
1748	0 3 7 18	316	962	175	3 2 32 24	3 18 7 54	1 16 37 41
1768	1 2 44 57	2	278	869	1 18 26 54	1 7 13 48	1 5 50 22

Number C is the period of 437 days (wherein the three innermoſt ſatellites return very nearly to the ſame ſituation in reſpect of one another, and of Jupiter's ſhadow), in milleſimals of a circle; and muſt be corrected by the equation of number B, under a contrary title.

The ſecond ſatellite has a ſynodical equation of 16′ or 17 in time (whoſe revolution is in this period), to be ſubtracted, if numb. C be leſs than 500; added, if greater. The firſt and third ſatellites have alſo ſmall ſynodical equations (returning in the ſame period), that of the firſt ſatellite being about 3′, of the third about 2′ in time; both to be added, if numb. C be leſs than 500; ſubtracted, if greater.

The orbit of the third ſatellite is manifeſtly excentric, as well as that of the fourth. Its apojovium in 1728 was about 10° of ♈, and moves forward 35° in 20 years: its greateſt equation is about 15′ in the ſatellite's orbit, or 7′ in time.

The apojovium of the fourth ſatellite in 1728, was in 12° 30′ of ♓, and moves forward about 12° in 20 years: its greateſt equation is 53′ in the ſatellite's orbit, or 59′ in time.

I found no reaſon to make any alteration in the ſemi-durations of the eclipſes of the firſt ſatellite from Mr. Pound's tables.

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The greateſt ſemi-durations of the eclipſes of the ſecond, third, and fourth ſatellites in the nodes, are $1^h\ 27'$, $1^h\ 47'$, and $2^h\ 24'$ *, reſpectively.

The nodes of the ſecond ſatellite ſeem to be at reſt in about 50° of ♒ and ☊; but the inclination of its orbit varies from 2° 50′ to 3° 52′: it was leaſt in 1668, greateſt in 1715, and ſeems to have been at its greateſt and leaſt once in the intermediate years. I ſuppoſe it at the leaſt in 1730.

The nodes of the third ſatellite in 1727, were in $16\frac{1}{2}°$ of ♒ and ☊, and move forward about $2\frac{1}{2}°$ in 20 years: the inclination of its orbit in 1695 was 3°, and has been increaſing ever ſince: it ſeems as if it would get to its maximum about 1765, and would then be about 3° 24′.

The nodes of the fourth ſatellite in 1730 were in $13\frac{1}{2}°$ of ♒ and ☊, and move forward 2° in 12 years: the inclination of its orbit is about 2° 40′, and does not ſeem to vary above one or two minutes either way.

From theſe elements, it will be eaſy for any perſon, moderately ſkilled in ſuch matters, to conſtruct tables of the motions of the ſatellites in the method of Mr. Pound, which may be ſeen in the latter part of Halley's tables.

I am, SIR,

Your humble ſervant,

Richard Dunthorne.

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* The ſemi-durations of the eclipſes of the fourth ſatellite will be about 2′ more at the aſcending, and 2′ leſs at the deſcending node, on account of the excentricity of its orbit.